

An essay on the history, pathology, & treatment of diphtheria / by Edward Copeman.

Contributors

Copeman, Edward, 1809-1880.
Royal College of Surgeons of England

Publication/Creation

Norwich : Henry W. Stacy, 1859.

Persistent URL

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Musculi

AN ESSAY

ON THE

HISTORY, PATHOLOGY, & TREATMENT

OF

DIPHTHERIA.



BY

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c
Norwich:

HENRY W. STACY, OLD HAYMARKET.

LONDON: JOHN CHURCHILL.

1859.

NORWICH:
HENRY W. STACY, (LATE MUSKETT), PRINTER,
OLD HAYMARKET.

P R E F A C E .

My apology for publishing the following short account of Diphtheria is, that a disease called by that name, is now prevailing in England, and in our own county; in some instances suddenly seizing and destroying its victims with frightful rapidity, and assuming characters not clearly recognisable by a large majority of the present race of medical practitioners. Under these circumstances I have thought it advisable to place before the Profession such knowledge of its character as I have been able to obtain for my own satisfaction and guidance; and hope that by the means, others may find their difficulty lessened when called upon to encounter an apparently novel, and undoubtedly formidable disease.

Most of what I have stated is based upon the authority of other writers; and it would be premature to speak very much or strongly, upon personal experience of the treatment of an affection which has not yet been amongst us a sufficient length of time to make the practice of individuals of much general or decided value. It may fairly be expected, however, that ere long, the experience of different practitioners in various localities will be collected and compared, and satisfactory conclusions arrived at, as to the nature of, and treatment best suited to, a disease which, like other epidemics, will probably not be satisfied with making a single visitation amongst us. If these objects should in any degree be furthered by the information contained in the following pages, any trouble I may have experienced will be most amply rewarded.

E. C.

Norwich, January 1859.

DIPHThERIA.

DIPHThERIA, or Diphtheritis, a term derived from the Greek $\Delta\iota\phi\theta\epsilon\rho\alpha$, (a hide, skin, slough, &c.,) has been employed to designate a disease which at the present time prevails in this country, and in some instances with such fatal effect as to produce consternation and alarm in the mind of the public. It is by many supposed to be a new disease, the proper management of which has yet to be decided after much painful experience; it is thought that medical science has a new adversary to encounter, and that medical experience can scarcely yet be brought to bear upon the treatment of it. It must always happen that diseases which occur epidemically after intervals of many years, are new to the personal observation of a large number of medical men, who have not been long in practice; and when a disease, which although long known as a matter of history, occurs in more recent times under a new name, a degree of confusion and uncertainty is very likely to be the consequence.

The present epidemic has undoubtedly visited us with such suddenness and severity as to make it incumbent upon all practitioners to take great pains to understand it; and although it has generally been found that any epidemic disease makes more havoc with life at its onset than after it has become accustomed to its location, I believe that any light thrown upon the history and character of Diphtheritis will be acceptable to those who may be called upon to treat it. Even in its milder phases it is a formidable disease, best managed in its early stage; and the public cannot be too strongly urged to seek the advice of a qualified medical man as soon as the slightest suspicion of its existence is entertained. *Rilliet* and *Barthez* have given us a concise history of Diphtheritis, or *Pharyngite pseudo-membraneuse* as it is also called, founded principally upon information published by Bretonneau and Deslandes. Aretæus is said to be the first author who has given a detailed history of the disease, under the name of *ulcus syriacum*, *ulcus egyptiacum*, of which he describes two varieties; in one the patches of false membrane are white and small; and in the other, they are large, depressed, and exhale a fetid odour. He also refers to its occasionally implicating the air passages, and remarks upon the silence of previous authors with respect to this disease, giving the year 1557 as that in which it first took its place in a system of nosology. In that year Pierre Forest observed it at Alkmar in Holland, and it appeared at the same

time in other parts of Europe. It broke out again at the beginning of the seventeenth century in Spain, and was described by Mercatus, Villareal, Nunnez, &c.; the disease began in the tonsils, afterwards spread to the air passages, and the patient died of suffocation; so that it received the name of *garotillo*. The epidemic in Spain had not ceased, when the same disease developed itself with equal severity in the city of Naples in 1618. The description left us by Carnevale, Nola, Zacutus Lusitanus and Marc-Aurel: Severinus prove it to be the same disease as that described by the Spanish physicians. It began by a slight inflammation of the throat; the affected parts soon became pale; the breath became offensive, deglutition was seriously interfered with, and the voice lost; then respiration became embarrassed, and the children died as if they had been strangled. Ten years after the epidemic of Naples, there was another at Kingston, in North America. The disease attacked children more particularly, and in many instances, there were exudations observed behind the ears, and on blistered surfaces, similar in character to those within the throat. France did not escape, for it reigned in Paris from 1743 to 1748, and was described by Malouin and Chomel. About the same period it raged in England, and at Cremona. Fothergill and Starr described the epidemic as it occurred in England, and Ghisi that of Cremona. Fothergill connects it with scarlet fever, but Starr describes it as a primary disease, and says he

frequently observed the extension of the inflammation to the air passages. Ghisi made the same remark, and further states that he met with one isolated case in which the larynx was the primary seat of the disease. By all these authors the disease of the fauces was supposed to be accompanied either with ulceration or gangrene; but M. Bretonneau has abundantly proved by his post-mortem investigations, that the fætor arose from putrefaction of the false membranes, leading to the mistake that it depended upon true sphacelus of the parts.

Samuel Bard, of New York, 1771, gave a very faithful description of *angina membranosa*. His opinions correspond with those of Bretonneau, and he recognises the analogy between this disease and croup, as well as the manner in which it spreads from the throat to the larynx; he observed it sometimes as simple angina, sometimes as angina complicated with laryngitis, and occasionally as laryngitis alone. He says the angina is never a gangrenous affection, and regards the pseudo-membranous patches as the product of a concretion. The opinion of Bard fell into oblivion; medical men continued as they had done before, to regard croup and angina as distinct diseases, and more than ever believed in the gangrenous nature of angina. *Jurine* discovered the bonds which united angina to croup, and preconceived that the inflammation of the fauces was not a gangrene. But to have this proved to demonstration was left to M. Bretonneau, who has shown in

the most satisfactory manner the identity of character of the different pseudo-membranous mucous and cutaneous inflammations, hitherto described under the name of angina gangrenosa, croup, &c., as well as demonstrated most unequivocally the absence of gangrene in the angina called gangrenous. Since his time, many epidemics of angina have been observed and described by different physicians in France and Switzerland, corresponding almost entirely with the description given by the physician of Tours.

In a review of Bretonneau's work in the *London Medical Repository*, great merit is awarded him for his patient and anxious investigation of Diphtheritis, and for the light he brought to bear upon a difficult and imperfectly understood disease. In the latter part of 1818, a form of malady appeared at Tours, which, although *by no means new or previously unobserved* by medical authors, prevailed to such an extent, was so little understood in the beginning, and was attended with such alarming fatality, as to attract the most serious attention of the practitioners of that city. An immense number of youngpersons fell victims to this disorder; in some families four or five children died of it, one after another, in a very short space of time: it seemed for a time to disappear, and returned more than once. Six years after it was first noticed at Tours, it prevailed at La Ferrière, and destroyed eighteen patients out of twenty-one who were

attacked with it, in a population of 250 souls. Even at this time (1826) although rarely, cases of it are met with.

The fatality of the Diphtheritic angina, and its ungovernable character under all ordinary means, make the consideration of its treatment exceedingly important: its fatality was far beyond that of common epidemics; and the usual methods of treatment seemed not only not to alleviate, but actually to exasperate the malady. So long as the practical measures were directed against the mere violence of the disease, or resorted to with a zeal and haste supposed to be called for by the rapidity of its progress, so long were such efforts eminently, nay, almost uniformly, unsuccessful. Bleeding, by means of leeches, was carried to the utmost extent, not only without a good effect, but apparently with that of increasing the tendency to the spreading of the Diphtheritic inflammation; blisters were most actively employed without the least advantage; vomiting and nausea were excited without producing the least amendment; sinapisms, pediluvia, purgatives, stimulating enemata, &c., were persevered in so long, that M. Bretonneau confessed he was astonished that he did not sooner see their absolute inadequacy to the required end. The only means from which any good was derived was the application of the concentrated muriatic acid to the spots or patches of false membrane, as far as it could be reached; and this of course was an agent of very limited powers when

the larynx, trachea or bronchi were filled with such membrane. Whilst these trials were going on (from 1818 to 1820) cases of the Diphtheritic angina presented themselves to the particular observation of Dr. Conolly, who resided and practised in that city. His first two cases ended fatally in one week; the first being the youngest daughter of an English gentleman residing at Tours, and the second the governess in the same family. Both these began with the appearance of common sore throat; but as Dr. Conolly was convinced that both the patients had died of true croup, *commencing in an unusual manner*, he determined to try the free and repeated administration of calomel, in the event of meeting with any similar case. An opportunity soon occurred; another case presented itself in the same family in which the two former had happened, and the consternation of the family, and the anxiety of the medical attendant may readily be conceived. The subject of this attack was a young lady fourteen years of age, and Dr. Bretonneau attended with Dr. Conolly, as he had done in the other two cases. Calomel was proposed in a consultation with Dr. Bretonneau and another French physician. The practice was new to them; they acceded, however, to this proposal, on the express condition that they were to be considered as mere spectators, and not in any degree accountable for the result. Five grains of English calomel were given every two hours for twenty-four hours, when in consequence of the mouth becoming affected, it

was given every four hours only for twenty-four hours more. As soon as the system became evidently affected by this medicine, the symptoms began to yield; the white specks or patches separated and came away, and the patient eventually recovered. The epidemic continued to prevail among the French inhabitants during the whole of the summer of 1820, with a most lamentable fatality. Three other cases, in the children of English residents, presented themselves to Dr. Conolly; all three were treated with calomel, and all three recovered. At length a case occurred which fully convinced M. Bretonneau of the value of calomel. The success of the English treatment had of course been spoken of, even among the French; and Dr. Conolly was one day besought by a poor French woman to see her only child, a boy six years of age, who was dying of croup; and whose case had been given up in despair by the French practitioners, including M. Bretonneau: appearances were, indeed, so bad, that the mother had been told there was no hope. It is but candid to say, that such, on first seeing the child, was Dr. Conolly's opinion also; the stridulous breathing might be heard on the outside of the house; the pulse was 160; and everything indicated the last stage of croup. For the satisfaction of the mother, rather than with any hope of advantage, five grains of calomel were given to the child every hour; six hours afterwards the boy seemed to breathe a little better, the respiration appeared not

so *dry*, and the medicine was continued for four hours more, when the gums beginning to be affected, it was given every two hours only; at the end of twenty-four hours the child began to expectorate; and at length *the whole of the false membrane was expelled*. The calomel was persevered in for some days longer in diminished doses, and the child got well. M. Bretonneau refers to the case in the following terms:—"Even in cases where the topical treatment is no longer applicable, an energetic mercurial treatment affords a precious resource. It was only towards the end of the epidemic that an example of unexpected cure, obtained by an English surgeon, M. Conolly, became the occasion of new trials, which were crowned with a success that exceeded all expectation." The reviewer after mature deliberation has not the smallest reason to doubt that the cases were all instances of modified croup, that it was a disease in which not the violence only or the rapidity of its progress were the great obstacles to successful treatment, but *the tendency to the formation of false membranes which, by their extent or accumulation, opposed an impediment to respiration, and destroyed the patients by asphyxia.**

The following is the method employed by M. Bretonneau, of applying the muriatic acid, on which he placed so much dependence, and which, when the complaint is confined to the pharynx, appears to be of singular service.

*London Medical Repository, 1826.

The first touch of the muriatic acid whitens the epithelium, which is detached and renewed without erosion. But if the action of the acid is prolonged or repeated at short intervals, it produces an ulceration, which becomes covered with a whitish concretion, and cicatrises more or less slowly. It is necessary to be aware of this circumstance when we apply the acid to modify Diphtheritic inflammation, so as not to confound the disease with the effects of the remedy ; or we might persevere with the application much longer than was necessary. It is best that the first applications be energetic, and that they be seldom repeated. "I have tried different methods, and give the preference to the following:—In order to convey the acid to the back of the pharynx and to the tonsils, I make use of a fine sponge firmly fixed to the end of a curved piece of whalebone. Before touching the false membrane of the throat, I soak the sponge in concentrated acid, and then press it until it is simply moist. This precaution is taken to prevent the acid being squeezed out by the convulsive movements of the throat, and carried beyond the part where it should be applied. In this manner it is easier to direct and graduate the action of the caustic than by mixing it with honey. It is only in cases in which the Diphtheritic inflammation of the pharynx already extends beyond the sphere of sight, that this latter mode of application is to be preferred. The first effect of the topical treatment is to give a more serious appearance to the incipient

Diphtheritic inflammation, the concretion appearing at first thicker, and more extensive. In twenty-four hours afterwards, the effects of the acid are limited, and have reached their acme. If the concretions do not increase, if they begin to be detached, we may be assured that the specific inflammation is already modified; after that, the topical applications should be used at intervals of from twenty-four to thirty hours, and limited in number, strength, and duration."

In a paper on the recent progress of medicine published in the "Edinburgh Medical and Surgical Journal" in 1817, it is stated that "No disease of the human body set so many pens in motion, during this period, throughout the civilised world, as the *angina membranacea*; not merely because it has become more common, but because the tyrant of the world allotted an extraordinary prize for the best treatise on this disease, by which he had lost one of his favourites. This was done on the 4th of June 1807, and in the beginning of 1812 the report of the French committee upon the best answer to their prize question, appeared. Among seventy-nine answers, the prize was conferred upon two treatises by *Jurine*, and *J. A. Albers*.

In the first volume of "Medical Observations and Inquiries," published by a Society of Physicians in London, in the year 1771, I find an extract of a letter from Cadwallader Colden, Esq., to Dr. Fothergill, concerning the *throat-distemper*, dated Colden-

ham, in New York, October 1, 1753. He says:—
 “The first appearance of the throat-distemper was at Kingston, an inland town of New England, about the year 1735. It spread from thence, and moved gradually westward, so that it did not reach Hudson’s river till nearly two years afterwards. It continued on the east side of Hudson’s river before it passed to the west, and appeared first in those places to which the people of New England chiefly resorted for trade, and in the places through which they travelled. It continued to move westerly, till I believe it has at last spread over all the British colonies on the continent. Children and young people were only subject to it, with a few exceptions of some above twenty or thirty, and a very few old people who died of it. The poorer sort of people were more liable to have the disease than those who lived well, with all the conveniences of life; and it has been more fatal in the country than in great towns. In some families, it passed like a plague through all their children; in others only one or two were seized with it.

“Ever since it came into the part of the country where I live (now about fourteen years) it frequently breaks out in different families and places, without any previous observable cause; but does not spread as it did at first. It seems as if some seeds, or leaven, or secret cause remains wherever it goes. When the distemper becomes obvious, it has the common symptoms attending a fever, except that

a *nausea* or vomiting is seldom observed to accompany it. It is attended with a moist putrid heat, the skin being seldom parched. The pulse is usually low, but frequent and irregular, the countenance dejected, with lowness of spirits; no considerable thirst; the tongue much furred, and the furring sometimes extends all over the tonsils as far as the eye can reach. At other times, in the milder kind, the tonsils appear only swelled, with white specks of about a quarter of an inch, or half an inch diameter, which are thrown off from time to time, in tough cream-coloured sloughs. Sometimes all the parts near the gullet or throat are much swelled, both inwardly and outwardly, so as to endanger a suffocation, and frequently mortify; but most generally the swelling internally is not so much as to make swallowing difficult. Sometimes these swellings imposthume. The last complaint commonly is of an oppression or straitness in the upper part of the chest, with difficulty of breathing, and a deep hollow hoarse cough, ending in a livid strangled-like countenance, which is soon followed by death. This disease is not often attended with the loss of strength that is usual in other fevers; so that many have not been confined to their beds, but have walked about the room till within an hour or two of their death; and it has often appeared no way dangerous to the attendants, till the sick were in their last agonies. Some died on the fourth or fifth day, others on the fourteenth or fifteenth, some even later.

When this disease first appeared, it was treated with the usual evacuations in a common angina, and few escaped. In many families who had a great many children, all died; no plague was more destructive. All sensible evacuations of every kind, after the disease has continued some time, are destructive." Confining the sick to bed, in a moderate warmth, and using *serpentaria* as a diaphoretic and antiseptic, was found the most successful treatment; the local applications being gargles made with decoction of *serpentaria* and alum, and touching the sores on the tonsils frequently with the compound tincture of aloes mixed with honey.

I need scarcely produce any further authorities, although many others might be referred to, in proof that the epidemic sore throat with which we are at the present time visited, is by no means a new disease; but I cannot refrain from quoting in addition the succinct and accurate definition of the disease given by Dr. J. Copland in the seventeenth number of his admirable dictionary, under the title of *Inflammation of the Throat with plastic Exudation*. It is as follows, and reminds us forcibly of the brief, but faithful and comprehensive descriptions of Cullen:—"Soreness, pain and heat in the throat, often increased on deglutition; redness with an exudation of a buff or grey-coloured lymph in spots or patches, at an early stage; commencing in either the fauces, or the tonsils, or pharynx, and quickly extending to these, and often also to the

larynx and œsophagus; the exudation becoming more continuous and firm, accompanied with fever, and appearing generally either epidemically or endemically."

Enough has been said to convince any one who has seen the disease in question, that it has been familiar to medical men at various times and in various countries, and that it has moreover been the subject of very considerable study and patient investigation. We of the present day have hitherto seen but little of it in this country, but it has now come amongst us, and we ought not to neglect any means by which we may be enabled to deprive it of its malignancy or arrest its progress. For further instruction I am induced to present a translation of portions of an article on Diphtheritis, of considerable merit, published by Rilliez and Barthez, in their excellent work on the diseases of children.

Rilliez and Barthez.

The angina described by authors under the name of gangrenous, *couenneuse*, pseudo-membranous, and to which M. Bretonneau has applied the term Diphtheritic, is a disease which principally attacks children, and the character of which has given rise to numerous discussions. It may occur as a primary disease (the true Diphtherite of Bretonneau;) and also as a secondary disease, supervening most commonly upon eruptive fevers.

Pathological Anatomy of primary pseudo-membranous Angina.

The uvula, tonsils and pharynx are covered by false membranes of greater or less thickness, of a yellow or yellowish white colour, and sometimes grey. They exhale no fetid smell after death, and are generally very firmly adherent to the subjacent mucous membrane, especially in the pharynx and arch of the palate. The tonsils are rarely covered with a continuous layer, but spotted here and there with patches of various sizes, many of which penetrate into the lacunæ of these organs. In the pharynx, the false membrane forms a large plate, a sort of yellow covering to the mucous membrane, sometimes continuous, sometimes disposed in broken or interrupted layers. The false membranes have sometimes a grey colour which led for a long time to the belief that they were the result of gangrene, but the gangrenous aspect of the pharynx is due to the putrid degeneration of the pellicular concretions themselves. The exudation of blood, which is not unusual in Diphtheritic inflammation, completes the error. The false membrane coloured by this fluid, successively assumes various hues, which are indications of its decomposition. These membranes sometimes consist of several layers one upon another; in certain cases they are thin and semitransparent, so as not to be easily recognised. Their chemical characters resemble those found in the larynx. They lie directly upon the mucous membrane and are not covered with epithelium.

According to Bretonneau, the subjacent mucous membrane generally retains its ordinary polish and consistence, some slight ecchymoses and abrasions of the surfaces being the chief alterations of tissue. But we have seen cases in which there were much more serious lesions, and in two of our patients the pharynx was deeply ulcerated. We cannot therefore doubt the *possibility* of pseudo-membranous inflammation terminating in ulceration, although such cases must be regarded as altogether exceptional. In cases of *secondary* pseudo-membranous pharyngitis, however, ulceration is a frequent occurrence.

Tumefaction of the sub-maxillary glands, especially those situated under the angle of the lower jaw, is almost always present, but they rarely suppurate. In the early stage of the disease they are reddish, soft, homogenous; but afterwards they assume the colour and consistence of a kidney.

The disease is seldom fatal when the pseudo-membranous inflammation does not extend to the air passages. When the latter are affected, they exhibit the same appearances as in pseudo-membranous laryngitis or croup.

Symptoms.

On examining the throat we sometimes discover the pseudo-membranous deposit from the first, and at other times only tumefaction and redness of the tonsils, the pseudo-membranous concretions not appearing till the following day. They

almost always appear first on one of the tonsils, but but in one case we observed it first on the uvula. Generally speaking, at the moment of its formation or soon after, the false membrane appears on the tonsil in the form of a white, or yellowish white speck, seldom grey, clearly circumscribed, thin at its edges, slightly projecting in the centre, and surrounded by a bright red circle. Occasionally the false membranes are semi-transparent, forming a thin pellicle enveloping the tonsils; but they soon lose their transparency and assume a yellowish white aspect, not improperly termed *lardaceous*. Soon afterwards they spread more or less rapidly according to the circumstances of the case and the treatment adopted. After being developed on the tonsils, the false membrane is deposited on the velum, uvula, and lastly on the pharynx, extending to these parts one after another. In other cases, the Diphtheritic inflammation attacks several points at once, which, converging towards each other, ultimately form a continuous surface. At the same time that the false membranes increase in extent, they acquire greater thickness. They no longer present themselves in the form of simple spots, but in laminae of greater or less extent, varying in appearance according to the parts they occupy. Thus, on the tonsils, they present an aspect to which *M. Bretonneau* has given the name of *lichenoid*; at other times they look like a deep ulceration with a yellow base and projecting edges. *M. Guersent* says their appearance is

different upon the uvula; sometimes surrounding that organ like the finger of a glove; sometimes altering its form, and giving it a hooked appearance. On the arch of the palate they simulate a deep excavation. It is not always easy to distinguish the false membranes in the pharynx; a covering of mucus sometimes deceives the practitioner; at other times the pellicle is semi-transparent, so that it cannot be readily distinguished from the mucous membrane; and the difficulty of examining the parts still further obscures the diagnosis. The interval between the formation and the detachment of the false membranes is about two or three days, and when detached they are soon reproduced. When the separation is spontaneous, they get thinner and assume a gray colour. This generally happens about the sixth or seventh day if they are not to be renewed. Otherwise, about the same period, they do not become detached, but get thinner and thinner until they are no longer visible. This is the general appearance of the false membranes, but sometimes they present a very different aspect. We then observe greyish shreds, spotted with red and black, hanging from the tonsils and velum palati—the soft parts of the fauces look as if deeply mortified; the velum, tonsils and mucous membrane of the fauces seem partly detached; on the tonsils, large grey patches surrounded by a violet red border appear, like gangrenous eschars. M. Bretonneau has rarely met with the disease in this form, whilst in

several epidemics of which a history has been given, these symptoms have predominated. The breath becomes very offensive, the saliva flows abundantly. When the false membranes are detached, the subjacent tissues are more or less red, and the tonsils and uvula seem lessened in size.

The false membranes do not always occupy the same situation; thus in twenty-one cases they affected the tonsils alone	6
The tonsils and some portion of the arch of the palate	4
The tonsils, arch of palate and pharynx	6
The tonsils and pharynx	5

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A very frequent accompaniment of the disease is swelling of the sub-maxillary glands, but it is difficult to say at what precise period of the complaint this symptom manifests itself; it has been noticed at various periods from the first to the fifth day of the attack, and is always attended with pain on pressure. Occasionally the cellular tissue is involved in the inflammation, and then the neck acquires a considerable size; but this swelling depends as much upon œdema as inflammation. In these cases the movements of the neck are difficult, and the countenance is expressive of severe angina. The glands continue to enlarge for two or three days, then remain stationary, and return to their normal condi-

tion about the seventh or eighth day when the termination is favourable. The inflammation of the glands rarely terminates in abscess. *Pain* is not a constant symptom. When it is present, it is felt generally at the beginning of the attack and thus attracts the attention of the patient. In the case of a boy ten years old, there was no pain for five days, although from the commencement of the attack the velum was covered with false membrane. It is seldom intense, nor does it progressively increase; neither does it ever correspond with the apparent severity of the inflammation. *Deglutition* is sometimes but little impeded, whilst in other cases it is affected from the first. In one patient this symptom was very pronounced, the whole pharynx being obstructed by false membrane. A very remarkable fact is, that the difficulty of deglutition was absent in those cases in which the false membranes had a gangrenous appearance, whilst it existed in those in which the diphtheritic layer was yellowish, of small extent, and affecting the tonsils alone.

The functional disturbance generally bears but little proportion to the severity of the disease. The fever ordinarily is but slight, although occasionally it has been severe at the outset; the febrile movement being evidently influenced by the character of the epidemic. The digestive functions are but little disordered; frequently there is appetite, thirst is not increased, the stools are healthy and there is no vomiting. The nervous system is also frequently but little affected.

Description, Course, &c.

Pseudo-membranous angina begins with a febrile movement, generally slight; sometimes without fever at all; strength and appetite are not sensibly diminished. The child complains of pain in the throat, but deglutition is not at first much impeded. Very early in the disease we may discover nothing but a slight swelling of the tonsils; but most frequently we find false membrane already formed; white, or yellowish-white spots, thin at the edges, appear on the tonsils, which soon extend to the velum and then to the pharynx, assuming a lichenoid or lardaceous aspect; occasionally they are limited to the tonsils and soft palate; in certain cases they lose their white or yellow colour, and assume a grey or yellowish-grey tint, exhaling a very fetid odour; and saliva flows abundantly from the mouth. Soon after the developement of the guttural inflammation, the glands of the neck increase in volume, sometimes on one side and sometimes on the other, and occasionally at a later period the neck becomes enormously swollen. After a time, varying according as they are more or less intimately attached, the false membranes begin to separate, turn of a greyish colour, become moist, and are then rejected; at other times they remain adherent to the mucous membrane, gradually getting thinner and then disappearing, sometimes definitively, but at other times only to be reproduced. During the whole course of the disease the appetite may be partially preserved, and there is neither vomiting nor

diarrhœa, the fever being at the same time but slight.

In cases which terminate favourably, the formation of false membranes ceases, there remains only a little redness of the throat, the swelling of the glands diminishes, and at the end of eight or ten days the patient is convalescent.

In unfavourable cases, the inflammation primarily developed in the posterior fauces, afterwards spreads to the air passages, producing all the phenomena of croup. Sometimes the disease is aggravated by the formation of false membrane in the nasal fossæ giving rise to a plentiful yellowish fetid discharge from the nostrils. Occasionally false membranes are developed on various parts of the integuments, giving the disease a very peculiar aspect. And lastly, although M. Bretonneau appears never to have observed it, the disease may assume a typhoid or adynamic character. M. Bourgeois, who has described this form, regards it as the result of a poisoning of the system caused by the ingestion of decomposed secretions from the mucous membrane into the stomach and alimentary canal.

Diagnosis.

The false membrane establishes a clear distinction between Diphtheritis and catarrhal or tonsilar angina.

Before the appearance of the pellicle, it is true the precise nature of the angina cannot well be determined. In each, the appearance of the pharynx is

the same, the mucous membrane being injected, the tonsils more or less swollen. In the simple angina there is generally more pain, fever, and difficulty of swallowing; but the same symptoms are present in Diphtheritis, and the appearance of the false membrane is in reality the only phenomenon which enables the practitioner to establish a positive diagnosis. In simple angina, the crypts of the tonsils distended with their secretion, might lead to the mistake that they were patches of false membrane. The rapidity with which the crypts are cleared, the nature of the secretion itself and its locality, will often enable the physician after a few hours to determine the nature of the complaint.

From what has been previously stated it may be assumed that Diphtheria presents itself under two different forms; the one simple, and the other apparently gangrenous. Our readers have a right to inquire why we admit that cases of angina described under the latter denomination are in reality only those of the pseudo-membranous form. We answer them by repeating in what manner M. Bretonneau proved the identity of the two affections. Having noticed that during life the soft palate and tonsils appeared to be in a gangrenous condition, he found by examination after death, that this supposed gangrene had left the subjacent mucous membrane intact, and that his error in diagnosis had arisen from his having mistaken the putrid false membranes for eschars. He ascertained also that the pseudo-membranous layers

were continuous, without interruption, with a membranous cylinder lining the larynx and trachea; and he drew from these circumstances the conclusion that the writers who had preceded him had probably committed the same error of diagnosis as himself. We are inclined to believe that this experienced practitioner was perfectly right in denying the gangrenous nature of the epidemics described by ancient authors. They either neglected post-mortem examinations altogether, or were too careless in the performance of them to lead us to conclude from their researches the positive existence of gangrene, especially when we consider how easily they might have mistaken putrid false membranes for mortification. In appealing to the facts of the present day, we shall find incontestible proofs of the existence of such a disease as gangrene of the pharynx; but whether epidemic or sporadic it appears to us to differ widely from the form of angina described by ancient authors. We can understand that when gangrene prevails epidemically at the same time as Diphtheria, the two diseases may be accidentally united in the same individual. But we repeat that we cannot make use of these facts as a proof that pseudo-membranous angina terminates in mortification, and that the epidemics described by the ancients were really gangrene; for the phenomena of the latter grave disease, such as we have observed them, do not at all correspond with the description which ancient authors have given of what they incorrectly term gangrenous angina. To conclude—

1. There is too much confusion in the documents furnished by ancient authors for them to determine the disputed point.

2. Gangrene of the pharynx is a malady entirely distinct, in its course and character, from pseudo-membranous angina.

3. The Diphtheritic and gangrenous affections both appearing in the form of an epidemic, it is possible that a patient may be attacked with both simultaneously; but it would be simply a coincidence, and not in the relation of cause and effect.

4. The gangrenous form almost exclusively attacks children debilitated by previous disease; whereas in epidemics of Diphtheria, the most healthy individuals become the subjects of the affection.

Complications.

The complications which occur in Diphtheritis, may be arranged under the three following heads:—

1. They are of the same character as the angina itself.

2. They depend upon the general condition of the system.

3. They cannot be considered as dependent upon the primary disease, but must be looked upon simply as accidental.

To the first division belong Diphtheritic inflammation of other mucous membranes and of the skin, producing coryza, croup, &c. The coincidence and succession of these different affections is a very fre-

quent occurrence when Diphtheria is raging as an epidemic, and they generally appear in a regular order of succession. Angina or coryza first appears, then laryngitis, and afterwards bronchitis, although this rule is not without exception; they are rarely however, developed in an inverse order, and still less frequently do these several parts become affected simultaneously. When the disease is sporadic, the complications above mentioned are much more rarely observed.

To the second class of complications belong those hæmorrhages which sometimes take place in certain epidemics, and are said to depend upon diseased conditions of the blood. Sometimes it has been simple epistaxis; but in other cases the nasal hæmorrhage has been succeeded by hæmorrhage from the skin and mucous membranes, leading to extreme prostration and death. Typhoid fever, and gangrene of the pharynx may also be mentioned as possible complications of Diphtheria, when this disease is secondary. Amongst the third species of complications may be enumerated pneumonia, eruptive fevers, inflammations of various kinds, enteritis, erysipelas, &c., but we repeat, these are only to be regarded as coincidences.

Prognosis.

When the disease is sporadic, it generally soon yields to treatment; but when it breaks out in the form of an epidemic, the danger is influenced by the

character of the epidemic. If the inflammation be limited to the pharynx, and no false membranes form in the nasal fossæ, larynx, or skin, the disease is generally susceptible of cure. When the inflammation extends to the larynx, the prognosis is the same as in croup. When the false membrane shows itself in thick layers on the integuments accompanied by suppuration or erysipelas, the prognosis is extremely unfavourable, and death from prostration the result.

Causes.

Diphtheria is very often an epidemic disease, apparently favoured by cold and moisture, or by damp alone; by congregating a large number of children in too limited a space; and, by contagion. The causes however are obscure and but little understood. Boys are more liable to it than girls, and the period of life in which it is most likely to occur is from two to eight or ten years of age.

Treatment.

Whilst in simple angina antiphlogistic treatment should occupy the first place, it is on the contrary to *local* medication that recourse must especially be had in the treatment of Diphtheritis; although in some cases it is necessary at the same time to give medicines which may favour the absorption of the false membranes, and diminish the plasticity of the blood. When the epidemic assumes a typhoid

character it will be necessary also to sustain the powers of the system by suitable means.

The object in using caustic applications to the palato-pharyngeal mucous membrane, is not only to prevent the extension of the false membrane to the nasal fossæ, larynx, and bronchi, but also to substitute a simple, for a specific, inflammation. The success of local applications rests upon too solid a basis to be disputed. The nature of the epidemic has a good deal of influence over the success of the treatment. There are, so to speak, *fatal* epidemics; in which the inflammation spreads to the air passages, and whatever may be the treatment employed, the extension of false membrane is so rapid that caustic applications are in vain. In other instances, the progress of the disease is slower, and the local remedies have time to act.

The caustics generally employed are the hydrochloric acid, solution of nitrate of silver, powdered alum, and chloride of lime. M. Bretonneau employed hydrochloric acid, in a pure state or but little diluted, when the false membranes occupied any considerable extent of the posterior fauces. The acid was applied to the diseased parts by means of a pencil brush, or sponge fixed to the end of a piece of whalebone, the sponge being pressed so that it was simply moistened, and the acid could not run to other parts than those intended to receive it. This was applied several times a day. When the disease was severe, M. Bretonneau began the treatment with

two free applications of the caustic, at intervals of twenty-four hours, and afterwards used it somewhat diluted. The immediate effect of the cauterization was sometimes to detach the false membranes, which adhered to the sponge ; but it was noticed that the disease often seemed aggravated at the moment, and the false membranes increased in thickness. When the false membrane separates, the diseased surfaces exhibit a bright red colour and sometimes bleed a little. The application of the caustic is quickly succeeded by a diminution in the size of the tonsils and sub-maxillary glands, but sometimes the patches re-appear. The caustic should be applied rather beyond the diseased surfaces, in order to prevent as much as possible the extension of the inflammation. Solutions of nitrate of silver of various degrees of strength, or the solid nitrate itself, have also been employed ; and when the latter is used, great care must be taken to secure the caustic from escaping into the throat. Alum, calomel, and chloride of lime, may sometimes be used with good effect, and it is well to add to these a small quantity of gum arabic to make them adhere to the diseased surface. The easiest and best way of applying them is to introduce them on the fore finger, rapidly passing it over all the diseased parts.

Antiphlogistic remedies are not admissible except when the child is strong and vigorous at the time of the attack, the fever high, the disease rapid in its course, and there is no tendency to adynamia,

hæmorrhage, or cutaneous Diphtheritis. Leech bites or venesection, may indeed be the source of fatal hæmorrhage, or of dangerous cutaneous affections; and the possibility of such accidents should discourage entirely the employment of blisters in pseudo-membranous angina. M. Bretonneau discards bleeding and blistering, and has most confidence in local treatment. He mentions numerous instances of want of success by antiphlogistic remedies; but in the epidemic to which he refers there was scarcely any febrile disturbance, so that the principal indication for antiphlogistic treatment did not exist. M. Lespine, on the contrary, with reference to the epidemic of La Flèche, states that advantage was derived from bleeding when the pulse was full and hard, the skin hot, and the countenance flushed.

Emetics may be useful in certain cases, although they never ought to constitute the basis of the treatment of Diphtheria. When the disease increases rapidly, and there is a fear of its attacking the larynx, the efforts of vomiting, by detaching the scarcely formed pellicle, may perhaps oppose its progress. Besides, vomiting will sometimes favour the expulsion of the false membranes encumbering the pharynx and prevent these products, often in a state of decomposition, from passing into the alimentary canal, where they might occasion very injurious consequences. Emetics may be prescribed with advantage either before or after cauterization.

It is a difficult question to determine whether or not we ought to submit patients attacked with Diphtheritis to any general treatment. In cases in which the false membrane has invaded the larynx, it must be answered in the affirmative. Indeed under these circumstances, we must bring into play every mode of treatment that may tend to produce absorption of the false membrane.

In pseudo-membranous angina, the pellicular deposit is not of itself a source of danger; it is its extension to the air passages or nasal fossæ which alone compromises the life of the child. We believe, therefore, before submitting it to any active internal treatment, which is not always free from danger, we should direct our attention to the following considerations:—

I. Is the disease of a sporadic, or of an epidemic character?

II. If epidemic, what course has it generally pursued? is there a disposition to spread to the air passages, or does it rather confine itself to the pharynx?

III. Does the epidemic assume a low or adynamic form?

We are of opinion that general alterative treatment should be reserved for those cases in which the disease occurs as an epidemic, and shows a great tendency to implicate the air passages. In these, the usual treatment of croup should be employed (calomel, sulphuret of potash, &c.) If the disease is sporadic, the treatment should be confined to bleeding,

emetics, and local applications. If it be epidemic and of a decidedly adynamic character, a tonic plan of treatment must be pursued. Tonics should be prescribed where there is a tendency to gangrene, diarrhoea, and hæmorrhages from the different passages. Reason indicates that here the *general*, influences the *local* condition, and that the treatment should be directed to the former in preference. In such cases, we should have recourse to the preparations of quinine, serpentaria, &c., at the same time not neglecting the local treatment, which must always be attended to, whatever may be the character of the disease.

To recapitulate—A child is attacked with pain in swallowing, and an attentive examination of the throat discovers on one of the tonsils a slightly prominent white spot; the sub-maxillary glands are a little swollen; there is but little fever, and the breathing is easy; there exists no actual epidemic of Diphtheria;—employ the following treatment:

1. Apply some powdered alum mixed with a little gum to the diseased tonsil, with the forefinger; renew the application every three or four hours, examining carefully, first, whether the false membrane is easily detached; secondly, whether it remains the same size; thirdly, whether it increases. In the two former cases, repeat the local application two or three times and then wait; for it may be, that we are dealing with one of those little white pellicles or mucous concretions which appear now

and then on the tonsils, and may be mistaken for pseudo-membranous deposits.

If on the other hand, at the end of twenty-four hours the false membrane has increased in size, or if other spots are developed upon the tonsils or palate; first, give an antimonial emetic; secondly, after having allowed the child to rest for two hours, cauterize all the diseased parts either with the nitrate of silver, or hydrochloric acid; thirdly, if there is much fever, apply leeches to the mastoid processes, and a large moist poultice not too hot, round the neck, renewing it frequently; fourthly, if there be much excitement, prescribe mustard poultices to the lower extremities. On the following morning, apply the caustic a second time, (in a more diluted form if the false membranes have not increased in size, but of the same strength as before should this not be the case,) at the same time prescribing frequent small quantities of acidulated drinks. If the child is old enough, let a gargle be used frequently, containing alum; give also a laxative enema, and continue the mustard poultices.

Should the disease not extend, continue to employ the alum gargle, acidulated drinks, and mild laxative enemata for a few days.

II. Diphtheritis is raging as an epidemic, but it is not of a typhoid character; several cases, however, have been observed, in which the inflammation has spread to the larynx. We see the patient on the second day of the attack, and false membranes are formed to a considerable extent; prescribe—

1. An emetic, so as to produce vomiting.
2. Two hours afterwards, cauterize the diseased surfaces with a strong solution of nitrate of silver.
3. Give from one to three grains of calomel every two hours.
4. Prescribe emollient drinks.

The next day, repeat the application of the caustic ; continue the calomel. If the skin be not hot, nor the pulse full and strong, abstain entirely from letting blood ; but under opposite circumstances, apply leeches behind the mastoid processes, and prescribe a laxative enema.

III. The epidemic is of a typhoid character : the false membrane exhales a fetid odour ; the skin is pale, reaction but little marked ; there is a tendency to hæmorrhage, and the general powers are much depressed ; prescribe

1. Cauterization as before described.
2. Let the child wash the throat several times in the day with a gargle composed of Dec : Chinchon :, Tr. Myrrhæ : and Mel Rosæ.
3. Administer enemata composed of decoction of bark and powdered gum.

Continue the local applications for several days, gradually diminishing their strength. If deglutition becomes easier, prescribe internally a few spoonfuls of syrup of cinchona, or a mixture of iron filings and powdered bark ; leave off the injections.

In cases in which the larynx is implicated, and suffocation is imminent in spite of the means pre-

scribed—"If the treatment has been unsuccessful, the child is anxious, the attacks of suffocation are frequent, the voice lost, and the laryngo-tracheal whistling more marked, there should be no hesitation in having recourse to tracheotomy." With respect to the operation of tracheotomy, the authors from whom I have translated several of the preceding pages, quote a manuscript placed in their hands by Professor Trousseau, considered valuable as being the result of long and skilful experience. It bears materially upon the subject of this essay, and may be usefully added to what has preceded it, at all events such portions of it as relate to cases of Diphtheria. The question is asked, are we to wait until the patient is at the point of death, or should we proceed to the operation as soon as the symptoms indicate almost to a certainty that death will take place without it? To determine this we must take into consideration, on the one hand, the danger incurred by the operation itself, independently of the disease for which it is performed; and on the other, what are the chances of cure offered by it. Tracheotomy and laryngotomy have so often been performed for the removal of foreign bodies from the air passages without fatal consequences, that the operation cannot of itself be considered dangerous; whereas, on the other hand, many have died a few days after it has been resorted to for the relief of chronic inflammation of the larynx; but as in the latter case it is generally delayed until asphyxia is imminent, it is

reasonable to suppose that the impediment to the purification of the blood, the pulmonary engorgement, and the passive congestion of the brain observed during the last days, are not without their influence in rendering the operation unsuccessful. They show not that tracheotomy is absolutely speaking a dangerous operation, but only that it may become so when delayed too long; and the conclusion to be arrived at is, that in cases of membranous laryngitis, the operation should be performed at the earliest possible time after false membranes are detected, and there is good reason to believe that death will be the result.

It is easy to understand why an early operation should materially increase the chances of success. In the first place, the condition of the blood has not been deteriorated, nor pulmonary and cerebral congestion produced, by the degree of asphyxia then present; and secondly, the false membranes have not extended so far, and the means employed to prevent the bronchial tubes from being implicated, will probably be more efficacious.

Having decided upon the operation, in what situation ought it to be performed? Those who regard the simplicity of it as everything, will prefer laryngotomy, for the following reasons; fewer structures are implicated; there are but few veins in the way, the canal is more superficial; and there is no risk of wounding the innominata, or left common carotid, which in certain anomalous conditions, passes across

the trachea. These considerations are of some value, and the operation is certainly easier; but as to the immediate dangers of tracheotomy compared with those of laryngotomy, "I can only say that I have performed tracheotomy 121 times without having had to deplore any *immediate* accidents except in one instance where the patient, an adult, died of syncope at the moment I incised the skin. It may certainly be said that I had not met with any abnormal arterial distribution; but as I always make it a duty to operate slowly, and never use the knife without directing it carefully by the hand and eye, I am confident that I should have avoided the left carotid even if it had arisen from the innominate and crossed the upper part of the trachea. I have several times had the innominate under the edge of my bistoury; but by inclining my incision to the left, and separating the tissues with the finger and a hook, I have completed these apparently perilous operations without fear or accident. Surgeons who pique themselves upon operating with marvellous rapidity, and boldly plunge a bistoury into the trachea dividing it upwards and downwards as soon as they have cut through the integuments, will have to lament their imprudent and useless haste when they have divided vessels which may be so easily avoided by those who care more about operating safely than quickly. Against the advantages of laryngotomy, whatever they may be, let us consider the inconveniences that may be connected with it. A canula

must be introduced and left in for several days, in contact with the thyroid cartilage, the cricothyroid membrane, and the edges of the divided cricoid cartilage. These parts become inflamed and affected with purulent infiltration, and the cricoid and thyroid cartilages may be denuded and necrosed. The same thing may happen with respect to the cartilages of the trachea; but that which in the trachea creates no difficulty, because the elimination of the necrosed portion takes place easily and without appreciable narrowing of the canal, would in the larynx itself become the cause of most serious accidents; for even if the croup were put a stop to, we should still have to treat the necrosis of the cricoid and thyroid cartilages. Now the separation of the necrosed portions is attended with chronic inflammation and suppuration; and we have to fear either that the skeleton of the larynx will remain permanently imperfect, or that the tumefaction of the laryngeal mucous membrane will occasion almost as much difficulty in breathing as the laryngeal disease itself, or at all events that the voice will be for ever compromised." In the performance of the operation M. Trousseau recommends that the incision in the skin should be made quickly; "that then we should uncover the trachea slowly, and lay bare several of its rings. The trachea is then to be very freely incised. The veins which present themselves in the course of the operation must be avoided if possible; but if they lie across the trachea and are very much

in the way, we may freely divide them and continue the operation without tying them ; for the hæmorrhage can be for the time arrested by the finger, and as soon as the canula is introduced into the trachea, it will cease." He also lays great stress upon the necessity of a particular kind of treatment after the operation, as contributing very much to its success. This consists in dropping a little water into the trachea every now and then, to facilitate the separation and expulsion of the false membrane, and sponging it out with a very small sponge fastened to the end of a flexible piece of whalebone ; with the same instrument, he also advises the application of a strong solution of nitrate of silver to the inflamed mucous membrane several times during the first three or four days.

On turning our attention to the features presented by the present epidemic, we shall find that it bears the same characters as those described in the preceding pages ; and as far as I have been able to ascertain, the disease requires local or topical treatment as much as that described by the French writers whom I have quoted. As a general rule the constitutional symptoms bear but little proportion to the local mischief, and the danger chiefly to be feared is the extension of the false membrane into the larynx and trachea, so as to produce suffocation in the same way as in croup.

It is true that on the first appearance of the epi-

demic, it in several instances knocked down its victims at once, showing itself as a poison too powerful to give time for the developement of any decided symptoms either constitutional or local. But this is a character common to almost all severe visitations of epidemic disease at their first onset; and, as I have said before, many of the patients who have since died from it have exhibited no very marked constitutional disturbance. For instance a fine, strong, healthy man between thirty and forty years of age, complained of slight sore throat on Wednesday; on the following day he was at a neighbouring market town and did not feel himself materially worse. It was not until Saturday that he applied for medical advice, and at midday on Sunday he died of asphyxia, having walked outside his house an hour before "to get air"; in his agony of suffocation, he attempted to thrust a stick down his throat to "make a passage." A medical man practising in Rutlandshire, whose district has been extensively visited by Diphtheria, informed me the other day that he had met with very great success from the use of a gargle composed of a dram of hydrochloric acid to half a pint of water; and that in children who were too young to use a gargle, he injected it into the fauces with a syringe. Another surgeon, practising in this county in a district which has been more seriously invaded than almost any other in Norfolk, told me he had scarcely lost a case since he began to treat his patients with the tincture of

sesquichloride of iron in water; this he used both as a gargle and as a medicine, directing a little of it to be swallowed each time it was used as a gargle. He admitted that his success depended in some measure upon the modified character of the epidemic, but expressed the greatest reliance upon the efficacy of the means he now universally and almost exclusively employed. From other sources, I have reason to believe that the local application of hydrochloric acid, more or less diluted, has been attended with more favourable results than that of nitrate of silver, either in substance or solution; and I have myself witnessed very beneficial effects from the use, as a local application, of Beaufoy's solution of chloride of soda. The concentrated solution should be applied to the affected parts once a day by means of a well-secured sponge. This gives little or no pain, and is often quickly followed by the separation of the false membrane. I have no hesitation in strongly advising it for the cure of Diphtheria, in conjunction with the use internally and as a gargle, of the tr. ferri sesquichloridi in the proportion of two or three drams to half a pint of water.

Where the deposition of false membrane has actually extended to the air passages, it can scarcely be doubted but that calomel is the principal remedy to be depended upon; its exhibition should be rapid and decided, and I would strongly recommend, as a useful adjunct, painting the whole larynx and trachea externally with tincture of iodine. In any

case in which the throat is much inflamed, warm flannels moistened with spirits of turpentine will afford relief, and this is a mode of treatment much recommended by Dr. James Copland, of London, and several others with whom I have conversed upon the subject. As in all diseases, prevention is better than cure, it cannot be too strongly impressed upon the minds of persons residing in districts attacked by Diphtheria, that the greatest attention should be paid to their own and their children's general health; and that none of those important means of preserving health and avoiding disease, which may be briefly summed up and included in the words, *good diet, pure air, temperance and exercise*, should at any time be unobserved or neglected. Neither should it be forgotten that, even after apparently slight attacks of Diphtheria, a considerable degree of nervous disturbance or depression has sometimes been occasioned by the disease; so that in every case it is advisable to watch the patient during convalescence, until the circulation, as indicated by the pulse, has been fully restored, and there is no fear of sudden syncope from exertion.

Finis.

NORWICH:

PRINTED BY HENRY W. STACY,
OLD HAYMARKET.

